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Valve for respiratory protection equipment, respiratory protection masks, or similar devices.

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Respiratory protection equipment, respiratory protection masks, or similar devices are equipped with valves of different varieties that are utilized as control valves, pressure relief valves, check valves, or similar.

It is known that said valves can be designed, for example, to be created as so called mica disc valves, or also as rubber disc valves that possess a closing component that consists of a mica, respectively rubber disc. Mica disc valves are rather involved in their construction because of the fact that the mica disc has to be guided in a specifically designed cage, and that it has to be loaded with a spring in the direction of its closing operation. Furthermore, the installation of the cage that is containing the disc requires rather much space, which leads to the fact that the air passage channels on the one side of the mica disc possess a larger diameter than the ones on the other side. This is also required to achieve an as low as possible flow resistance herewith.

However, I could imagine utilizing different materials than mica, but that will not change any of the described disadvantages.

Furthermore, also known are exhaling valves for respiratory protection masks that consist of elastic, pliable materials, such as rubber, plastic substances, or similar, with a centrally attached valve closing body that is designed in the way of a truncated cone mantle between its exterior edge and the exterior edge of its strengthened center section. With such a valve, the closing force with the closed valve is generated by means of deformation that is applied to the closing body if it is lying against the valve seat. Upon the passage of

air, the closing body lifts up at its edges and away from the valve seat, and it gets deformed into an almost flat surface. Valves of this kind can also be designed in such a manner that the truncated cone mantle that creates the closing body is separated into concentric rings, step like, and offset to each other. Said rings of the truncated cone mantle can approximately possess a sinusoidal shaped cross section. Finally, it is also known to reduce the thickness of the valve closing body of such valves between the exterior edge of the strengthened center section and the exterior edge of the disc. With all of these valves, the enclosure gets a larger diameter on the outlet side than the one that correlates with the valve closing body to achieve a lower flow resistance.

Furthermore known is an inhaling valve for respiratory protection masks that possesses a valve seat that is created by the body wall of said mask, and that is covered by means of a rubber disc creates the closing body. Herewith, said rubber disc is attached with both of it's sides, and about along it's center axis, to the wall of said mask. With other execution examples of said valve, the valve opening in the mask wall is enforced by a web, to which the rubber disc is attached at one point. Said valve closing bodies are not exposed to any tension if the valve is closed, and they can open into arbitrary directions.

Finally, there is an inhaling valve for full head masks known with which the body of the mask is created into a valve seat at the point at which the valve is supposed to be located, and the closing body that is designed as a membrane is partially glued or vulcanized to the mask body. Herewith, it is possible that said membrane could be glued to said mask body in an uninterrupted manner for the largest part of its circumference, in such a manner that a pocket will be created from which the exhaled air can exit. Herewith, it is possible to achieve a certain flow direction for the exiting air; however, it is not possible to create any predetermined closing force with said closing body.

The invention is concerned with a valve for respiratory protection equipment, respiratory protection masks, or similar devices that possesses a disc shaped, bendable valve closing body that is attached to the respiratory protection apparatus, the respiratory protection mask or similar along a straight line and at several points. The scope of the invention is to improve a valve of such kind in such a manner that the closing body on the one side lays against the valve seat with a certain closing force, and on the other side that it opens into a determined direction. According to the invention, the solution of this scope consists of the fact that the valve closing is equipped with one or several ribs at the opposite side of the valve seat, and of which at least one crosses the attachment line of the valve closing body in a rectangular manner. A valve closing body that is produced following the invention possesses the advantage that the valve closing body flaps open in only a predetermined direction, and that a certain force is required tc open said valve closing body. Furthermore, there are no modifications required to the simple design of the valve seat.

Further characteristics of the invention are subject to the sub-claims.

Execution examples of the invention will be explained with the support of the drawing. Displayed is in:

Fig. 1 a cross sectional cut through he first execution example,

Fig. 2 the top view to Fig. 1,

Fig. 3, the valve that is installed into a bent tube section,

Fig. 4 the view in the direction of the arrow A in Fig. 3,

Fig. 5 an isometric display of the valve closing body following the Figs. 1 and 2,

Fig. 6 the closing body following Fig. 5 in it's open condition, and

Fig. 7 a further execution version, also in an isometric display manner.

With the displays following the Figs. 1 through 6, the valve closing body 1 is equipped with a rib 2 that proceeds across the bending axis C-C. Said rib is created to resemble a bridge 3 in the area of the bending axis, which means, it is not in connection with the valve closing body 1 in the area of the bending axis C-C. However, there remains rather a free space between the closing body and said rib 2. Beyond the bending axis C-C, the rib 2 is split-up into 3 ribs 4, 5, and 6 that are lying across the surface of the body in a flabelliform manner. This results in a strengthening of the valve closing body in this area.

On it's side that is directed toward the valve seat, the valve closing body contains pegs 7 that are each inserted into a bore 8 of the valve closing body carrier 9 that, in turn, is connected to the valve carrier 10. Said carrier is equipped with the valve seat 11.

According to the Figs. 3 and 4, the valve closing body 1 is equipped with two pegs 12 and 13 that engage with the relevant counter pieces of a web 14 that is connected to the valve carrier 10, and that thus holds the valve closing body 1. Because of increased resistance strength, the web 14 is equipped with a rib 14a that is positioned in the center across from it's longitudinal axis. As it can be seen from the Figs. 3 and 6, the bridge 3 of the rib 2 bends over to the side upon opening the valve. This sideward bending over causes that the material of the rib does not need to be compressed via the bending axis C-C, which in turn would result in an increased resistance during the bending of the valve closing body 1. It is achieved by means of said bridge-like creation of said ribs that the opening resistance will not be increased any more, or that it will not be increased excessively and continuously, which means, that a too strong increase of the flow resistance will be avoided herewith. The valve closing body achieves it's required closing force by means of the rib 2.

As it is displayed in the Figs. 3 and 4, the exhaling enclosure 18 can be kept quite a bit smaller because the valve closing body 1 opens only into the displayed direction. The manner, in which said valve closing body opens could be adapted to the relevant conditions by means of the selection of the attachment line. Because of the eccentric attachment of the valve closing body following Fig. 3, the air is directed immediately into the tube elbow.

Fig. 7 displays a different constructional execution version with which the valve closing body 19 is equipped with two ribs 20 that are designed in a bridge like fashion in the areas of the bending axis D-D that is displayed in the drawing by means of dotted lines. A pin 22 is utilized for attaching the closing body. Said pin is put through the one end of the ribs 20, and it is attached with both of its sides to the valve carrier 23. The pin 23 will not create the pivoting axis, rather the two bridges 21 will bend out during the opening process of said valve; this means, the bending axis D-D is rather placed in front of the pin 22. With very high flow rates, also the smaller segment 24, respectively, 25 of the valve closing body 1, respectively, 9 will be lifted away from the valve seats with both types of valves.

Patent Claims

1. A valve for respiratory protection equipment, respiratory protection mask, or similar devices that is equipped with a disc shaped, bendable valve closing body that is attached along a straight line at several points in the respiratory protection equipment, the respiratory protection mask, or similar devices, characterized in such a way that the valve closing body (1, respectively, 19) is equipped with one or several ribs (2, 4, 5, and 6, respectively, 14a, respectively, 20) on its side that is in the opposing position to the valve seat, and with which at least one of said ribs crosses the attachment line of the valve closing body (1, respectively, 19) in a rectangular angle to said line.
2. A valve according to claim 1, characterized in such a way that the rib (2), or the ribs (20) are designed to represent bridge like structures (3) at least in the area of the bending axis (C-C, respectively, D-D) of the valve closing body (1, respectively, 19).
3. A valve according to the claims 1, or 2, characterized in such a way that the rib, or the ribs are arranged and designed in such a manner, and that the attachment line of the valve closing body proceeds in such a way that the bending axis proceeds through it's center.
4. A valve according to one of the claims 1 through 3, characterized in such a way that the rib (2), or the ribs proceed at least with one of their ends all the way to the edge of the valve closing body (1).
5. A valve according to claim 4, characterized in such a way that the extensions that proceed to the edge consists of several, flabelliform distributed and positioned ribs (4, 5, and 6).
6. A valve according tone of the claims 1 through 5, characterized in such a way that the valve closing body (1) is equipped with several pegs (7, respectively, 12, and 13) along its bending axis (C-C), and on the side that is opposing the side that contains the ribs (2, 4, 5, and 6, respectively, 14a), and that said pegs (7, respectively, 12, and 13) are utilized for it's attachment to the valve closing body carrier (9).
7. A valve according to one of the claims 1 through 5, characterized in such a way that the valve closing body (19) is connected to a pin like holder in a manner that

allows for pivoting motions, and with which said pin shaped holder runs through or above the rib or ribs (20), and with which said pin shaped holder is attached at one or both of its sides to the valve carrier (23) outside of the valve seat.

Printed documents that were considered herewith:

German Patent Documents No. 460 840, 1 027 518, 1 055 969;

Swiss Patent Document: No. 200 482;

US Patent Document No. 2 895 472.

Herewith 1 Sheet of Drawings

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